COURSE OUTLINE – subject to changes

week one: overview of the course and Python
L-1 Mon 21 Aug welcome to MCS 507 – SageMath, SciPy, Julia
L-2 Wed 23 Aug introduction to Python
L-3 Fri 25 Aug object-oriented programming in Python

week two: numpy, sympy, scipy, matplotlib, wrapping
L-4 Mon 28 Aug numpy, linear algebra, and vectorization
L-5 Wed 30 Aug sympy, scipy, and integration
L-6 Fri 1 Sep root finding methods – wrapping external software

week three: arithmetic, packaging, differentiation
Mon 4 Sep Labor Day holiday. No classes.
L-7 Wed 6 Sep interval and QD arithmetic – extending Python
L-8 Fri 8 Sep algorithmic differentiation – operator overloading

week four: a fresh approach to numerical computing
L-9 Mon 11 Sep introduction to Julia
L-10 Wed 13 Sep the Julia ecosystems
L-11 Fri 15 Sep scientific computing with Julia

week five: parallel programming
L-12 Mon 18 Sep multiprocessing and multithreading
L-13 Wed 20 Sep message passing with mpi4py and MPI.jl
L-14 Fri 22 Sep programming GPUs with Python and Julia

week six: cython, testing, documenting, packaging
L-15 Mon 25 Sep running cython
L-16 Wed 27 Sep pexpect and testing software
L-17 Fri 29 Sep documenting and packaging code

week seven: graphical user interfaces, web interfaces, and web servers
L-18 Mon 2 Oct movies with matplotlib, animations with Tkinter
L-19 Wed 4 Oct web interfaces, introduction to cgi scripting
L-20 Fri 6 Oct web servers

week eight: solving ordinary differential equations, review
L-21 Mon 9 Oct solving ordinary differential equations
L-22 Wed 11 Oct review
L-23 Fri 13 Oct midterm exam

week nine: data retrieval, analysis, and machine learning
L-24 Mon 16 Oct parsing HTML and web crawlers
L-25 Wed 18 Oct data analysis with pandas
L-26 Fri 20 Oct machine learning with scikit-learn

week ten: image processing, networks
L-27 Mon 23 Oct image processing
L-28 Wed 25 Oct graphs and networks with networkx
L-29 Fri 27 Oct image processing with scikit-image

week eleven: computational geometry
L-30 Mon 30 Oct convex hulls, Voronoi diagrams, Delaunay triangulations
L-31 Wed 1 Nov geometric queries, k-d trees, shortest paths
L-32 Fri 3 Nov computer aided geometric design, designing curves and surfaces, splines

week twelve: statistics
L-33 Mon 6 Nov probability and statistics
L-34 Wed 8 Nov statistical data exploration
L-35 Fri 10 Nov statistical computing with R

week thirteen and fourteen: groups, numbers, polynomials
L-36 Mon 13 Nov computational group theory with GAP
L-37 Wed 15 Nov higher arithmetic with PARI/GP
L-38 Fri 17 Nov computing with polynomials in Singular
L-39 Mon 20 Nov research in algebraic geometry with Macaulay2
L-40 Wed 22 Nov solving polynomial system with PHCpack and phcphy
Fri 24 Nov Thanksgiving holiday. No classes.

last four meetings on project presentations and/or review for the final exam